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# Cluster strategies for the North Sea the offshore wind service sector. A sectoral innovation system foresight.

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## Relevance and research aim

As Europe is working its way towards a low carbon future there are high expectations of the role of offshore wind, and the installed capacity is projected to increase significantly towards 2020 and beyond (EWEA 2014). However, offshore wind energy is relatively expensive, and the industry has outlined an ambitious goal of reducing the cost of offshore wind by 40% from today's average LCoE (Levelized Cost of Energy) by 2020. Services for project development installation, operation and maintenance (O&M) contribute up to 46% of LCoE (capital and operating expenditure). O&M services' contribution alone is estimated between 25 and 28% (Green & Vasilakos 2011). Hence, the services associated with offshore wind farms hold a significant potential for cost reduction. Furthermore, the North Sea is currently the most important site for offshore wind installations, and industry clusters based on OWS are emerging in regions around the North Sea.

Recently, several studies departing from the Technology Innovation Systems (TIS) approach have analysed the North Sea offshore wind innovation system (Rodrigues et al. 2015; Wieczorek et al. 2013; Jacobsson & Karltorp 2013). Among the conclusions of these studies is that there is a need for an orchestrated policy effort in order to strengthen the development and functioning of the European offshore wind innovation system (Wieczorek et al. 2013). This paper focuses on this knowledge gap, by presenting a sectoral innovation foresight study, which contributes with a range of recommendation for supporting the on-going development of offshore wind service sector clusters around the North Sea.

## Theoretical framework

The paper departs from the concept of innovation system foresight (Andersen & Andersen 2014; Andersen et al. 2014). The nexus between foresight and innovation systems has been explored by several studies (Alkemade et al. 2007; Cagnin et al. 2012; Martin & Johnston 1999; Markard et al. 2009). The innovation system foresight takes a further integration of the two fields of research.

First, most of the studies that focus on how foresight can contribute to innovation system policies adopt a predictive understanding of the future. A Swiss study notes that there is a strong need for assessing future development paths in innovation in order to develop effective innovation policy strategies (Markard et al. 2009). However predicting is only one of three generic approaches to the future. The other being an explorative approach and anticipative or normative approach (Börjeson et al. 2006). Innovation system foresight emphasises such other approaches to the future. Second, mirroring the development in innovation studies, foresight seems to be increasingly systems oriented, as it is gradually, albeit not always explicitly, implementing the systemic, contextual and evolutionary understanding of innovation that is dominant in the academic field of innovation studies (Dosi 1988; Martin 2014). There are several implications of this development in both innovation studies and foresight. In particular, it has been increasingly recognised that foresight is highly context dependent (Cariola & Rolfo 2004). Therefore, foresight must be able to systematically and coherently include context to conclude anything sensible about innovation and adequate innovation policies. Despite its importance, such work is currently limited (Schoen et al. 2011). Third, foresight exercises often do not take sufficient notice of the demand for knowledge, existing competences, and reality and wishes of firms, policy makers and other key stakeholders (Smits et al. 2010). The lack of a (demonstrable) impact of foresight has led to an increased focus on the demand side of the innovation process within foresight (Smits & Kuhlmann 2004). The rationale is that more seriously including demand and key stakeholders will increase the impact (Georgiou & Cassingena Harper 2011). Innovation systems foresight provides a platform for a wider inclusion of stakeholders.

In this context we define innovation systems foresight as systemic, systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilising joint actions to improve innovation system performance with the ultimate goal of improving desirable socio-economic

performance (Andersen & Andersen 2014).

The work is of course also based on concepts such as regional innovation systems (Asheim & Gertler 2005), the multilevel perspective (Geels 2005) and smart specialisation (Foray et al. 2012). However it is not the intention to go deeper in to that discussion.

#### Empirical material and methodology

The paper draws from a recently concluded project European Clusters for Offshore Wind Servicing (EcoWindS, 2012-2015) with the overall aim of project to increase the innovation capacity of the European offshore wind servicing (OWS) sector by establishing cross-regional cooperation and intensifying the relationship between research and the offshore wind industry. Furthermore, the aim of the project was to pave the way for new research and knowledge of how the costs of offshore wind energy can be driven down and partly to contribute to the growth of the many small and medium sized companies in OWS and hence strengthen European competitiveness in the market for offshore wind.

The project can be characterized as a generic sectoral innovation system foresight process (Andersen et al. 2014) that was adapted to the actual case. The process had three phases, each of which contained sub-phases. The planning phase comprised preparation and organisation of the foresight exercise. The main phase was the most comprehensive, as well as the most time-consuming and labour-intensive part of the foresight process. It is in this phase that sustainable knowledge, visions and future possibilities were developed and priorities set among the formulated possibilities on the basis of well-described criteria. The main phase was divided into four sub-phases: mapping, foresighting, prioritising and planning. The follow-up phase comprised two sub-phases: dissemination and learning.

The mapping followed the guidelines for analysing innovation systems (Hekkert et al. 2011; Wieczorek et al. 2013). Based on the mapping of regional resources, the project set out to establish and prioritise goals for the TIS and set a roadmap for achieving them. The roadmapping method is described in more detail elsewhere (c.f. Piirainen 2014). These concurrent activities constitute the foresighting, prioritising and planning stages.

#### Implication for policy

The foremost contribution of the research is to policy. The outcome of the study is a roadmap that presents a set of concrete actions at multiple levels to support the development of the sector. The actions are: 1) Establish a long lasting joint initiative for knowledge sharing and innovation between regions, 2) Develop a value proposition for OWS as an industry in itself, 3) Develop OWS specific mission-oriented research, development and innovation program, 4) Drive for international OWS specific standards, 5) Develop OWS specific skills and training programs across regions, 6) Develop an OWS Industry Database, 7) Establish OWS Specific Test Sites and Research Infrastructure, 8) Drive regulatory harmonization on Occupational Health & Safety. These actions and more detailed recommendations are built on the analysis within the project and illuminate development prospects of offshore wind services, and by extension offshore wind power in general. This is relevant for discussion both on research, development and innovation, as well as energy policy. In effect the findings will provide an input for a concerted effort to both support offshore wind development and support the emerging clusters of offshore wind services around the North Sea.

Additionally the research addresses the added value of the innovation systems foresight perspective, and in particular aspects of the process in terms of stakeholder interaction, effectively broadening the understanding of the effectiveness of foresight and planning of future foresight exercises.

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